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Comparison of the Uzboi Vallis and Nirgal Vallis (Mars) using swath analysis

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The presumably fluvially affected surfaces of Mars provide evidence of the variety of surface processes of the past of the planet. Throughout its history, the climate has enabled the presence of liquid water several times (perhaps periodically). Watercourses and mega-river systems have ruled the surface; their tracks are still recognizable in many places. The Argyre Crater might have served as the source of such a huge river system: the Uzboi–Ladon–Morava River System (ULM), during the Late Noachian. (Dohm et al 2015) ULM is therefore fundamentally different from most of the valleys and channels of Mars as it is not an amphitheatre-headed valley, it is composed of various types of sections, and its source is connected to a large crater. In this study Uzboi Vallis, a section of ULM was studied using data from the Mars Global Surveyor's Mars Orbiter Laser Altimeter (MOLA) data. A comparison is presented of Uzboi Vallis and its tributary, Nirgal Vallis. In addition to creating the stream orders of the valleys and traditional elevation profiles, we used the swath profile analysis method. The swath analysis is fundamentally different from elevation profiles that enhance the specific Martian conditions (impact cratering, the complete absence of the biosphere, less gravity). In addition to the swath analysis completely covering the two studied areas, several regions of the catchment were specifically analyzed. According to the results obtained, the Uzboi Vallis is at least partly tectonically modified. Based on these observations, in the northeastern part, half-graben structures are hypothesized. The method of swath profile analysis, previously not applied to Martian data, proved to be useful and provided interpretable data for the surface of a planet other than Earth.

Geomorphometric studies on terrain models are found to provide interesting information paving the way towards an in-depth understanding of this mega river system. Further analysis of the ULM is planned in the near future.

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